RADIATION PHYSICS NOTE 57

TESTING OF HEPA FILTER SYSTEMS

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Fermilab has three high efficiency filter installations in use. These systems are periodically tested using DOP for breakthrough and seal leakage. A question has been raised regarding the adequacy of Fermilab's testing method in the light of applicable testing standards.

It is known that ANSI Standard N510 is the usual standard for testing of nuclear air cleaning systems. This standard is referenced by ERDA 76-21 which appears to be the latest DOE guidance on nuclear air cleaning. This is a comprehensive program covering all phases of air handling system performance including airflow distribution and capacity as well as leak testing. It is the intent of this standard that it be rigorously applied only to systems designed and built to ANSI N509. ANSI N509 refers to nuclear power plant air cleaning units only. Selected portions of the standard may be used when applied to non-N509 systems.

In order to establish a basis for ventilation and air cleaning requirements, source term characterization and classification is necessary. In ERDA 76-21, hazard classification of radioisotopes is based on the MPC in air. The type of radiological protection is then based on the quantity of material handled and the isotope toxicity. Most of the isotopes handled at Fermilab fall in the category of moderate radiotoxicity (Class 3 as defined in ERDA 76-21). Facilities such as hot cells and glove boxes

handling greater than 1.0 Ci of these materials need to be equipped with HEPA filtered exhaust; designed and built to ANSI N509. A few of the isotopes handled are higher in radioactivity (Class 2). HEPA filtration is indicated when > 100 mCi of these isotopes are handled in an exhausted enclosure.

Assessment of the quantities and types of materials handled in each of the three permanent installations shows that in no case are these limits approached within an order of magnitude.

1. The system associated with the radioactive waste compactor is used only on an intermittent basis, generally one day per month. Based on compaction records, the waste is composed of ^{54}Mn and ^{22}Na and the compactor handles no more than 1 mCi at any one time. Most of it is non-respirable and non-combustible.

2. The chemical fume hood however is only operated when the hood is used. During the past few years it has been used mainly for non-radioactive chemicals. Most recently the only radioactive material present has been depleted uranium (250 grams).

3. The system at the $\bar{p}$ target vault operates continuously when the beam is on. A calculation done by P. Yurista[1] estimates that under worst case conditions, the maximum activity loaded on the exhaust filter is 7.3 mCi of ^{7}Be, arising from air activation in the target vault.

These results indicate that although the filter systems were purchased to meet ANSI specifications, there has never been a need for them to operate at ANSI N509 protection levels (> 99.97%). In view of the quantities of radioactive material handled, I recommend that we treat these systems as non-N509, and choose appropriate tests from those available in N510. Those tests are:

1. Visual Inspection - Proper adjustment of clamping devices, gasket inspection, check for visible damage to filter face.

2. Airflow Capacity Test - To verify that the specified volume flow rate of air can be achieved under actual field conditions. (Even though the filter/housing may not leak, the airflow may not be as specified).

3. In-Place Leak Test - Verification of the integrity of the filter, gasket and housing. This is the same DOP aerosol test which we have been performing for years.

It is recommended that these tests be run annually for the compactor and 21 Shabbona systems, and semi-annually for the $\bar{p}$ target system, since it runs constantly.

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1. Yurista, Peder, Memo to C. Zonick, "HEPA Filter at $\bar{p}$ Target Vault," October 23, 1985.